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Accumulated Temperatures above 10°C – a quick approximation

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For the purposes of assessing potential maize development accumulated temperatures over a base of 10°C are usually calculated from daily values of maximum and minimum. The relation between this parameter and mean monthly temperature (T) will depend on the deviation of daily values about the mean. Shellards monthly maps of standard deviation suggest that the largest geographical difference is that between coastal and inland areas.

Examination of May to October daily values for Leeming and Speke, already extracted for the common cold investigations led to the following approximations.

Leeming Day-degrees per day = $0.557\ T - 4.02$ $(T < 12.5)$
$= 0.893\ T - 8.16$ $(T > 12.5)$

with correlations 0.9783 and 0.9920

Speke Day-degrees per day = $0.59\ T - 4.58$ $(T < 12.8)$
$= 0.946\ T - 9.09$ $(T > 12.8)$

with correlations 0.9963 and 0.9983

It is suggested that these equations are suitable for an approximate conversion from average mean monthly temperatures, to average accumulated temperatures, above 10°C during the maize growing season.

An even simpler approximation to the maize (May–October) index of accumulated temperatures (I) would be

Inland areas $I = 23.79\ T_6 - 1178.6$

Coastal areas $I = 25.33\ T_6 - 1337.3$

with correlations 0.9997 and 0.9993

where T_6 is the sum of the monthly mean temperatures, which has been found by applying the first set of equations, month by month to the average temperatures of the agroclimatic areas.

If the index (I_m) is calculated from the monthly mean temperatures taken separately then

Inland areas $I = 0.895\ I_m + 169.35$

Coastal areas $I = 0.876\ I_m + 147.3$

with correlations 0.9981 and 0.999

the larger errors tending to occur when any monthly temperature is below 10°C, thus making a zero contribution to I_m. Therefore the T_6 formulae are to be preferred.

Any comments or suggestions on this paper should be referred to the author.

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